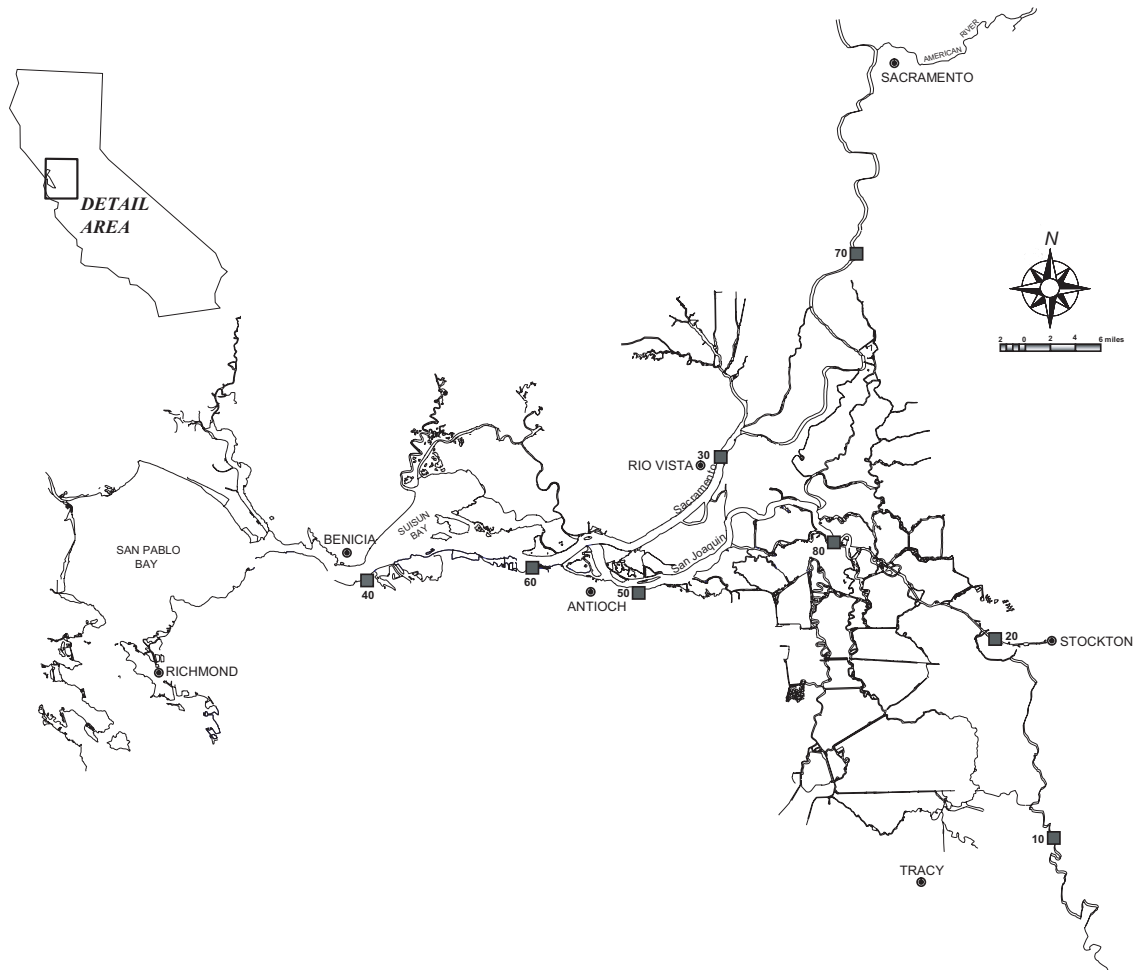


## Chapter 8. Continuous Monitoring, 1997-2000

The continuous monitoring program supplements the monthly D-1641 Compliance Monitoring Program by providing real-time water quality data from seven shore-based automated sampling stations in the upper San Francisco Estuary (Figure 8-1). These stations provide data used by operators of the State Water Project and the Central Valley Project to assess the impacts of the project operations and to adjust project operations to comply with water quality standards.

Water temperature, pH, dissolved oxygen (DO), and specific conductance are measured at all continuous monitoring stations with the additional parameters of chlorophyll fluorescence, air temperature, wind speed, wind direction, solar radiation intensity, and river stage measured at selected stations. Table 8-1 summarizes the measurements for each continuous monitoring station. The water quality data are collected at 1 meter below the water surface using a float-mounted pump and distributed to the water quality sensors. A data acquisition system scans the output from the sensors once per second and stores the average of approximately 3,600 readings on the hour.



**Figure 8-1 Map of continuous water quality monitoring stations**

**Table 8-1 Station characteristics for the Continuous Monitoring Program**

Station Name	Mossdale	Stockton	Hood	Rio Vista	Antioch	Mallard	Martinez
Parameters Measured	All <sup>1</sup> + Chlorophyll Fluorescence	All	All	All	All + Bottom EC <sup>2</sup>	All + Bottom EC & Stage <sup>3</sup>	All + Bottom EC & Stage
Sampling Interval	Hourly	Hourly	Quarter Hour	Hourly	Hourly	Hourly	Hourly
ID Number	10	20	70	30	50	60	40
River Kilometer Index # <sup>4</sup>	RSAN087	RSAN058	RSAC142	RSAC101	RSAN007	RSAC075	RSAC054
Latitude	37° 47' 11"	37° 57' 46"	38° 22' 05"	38° 08' 42"	38° 01' 04"	38° 02' 37"	38° 01' 41"
Longitude	121° 18' 22"	121° 21' 54"	121° 31' 10"	121° 41' 30"	121° 48' 06"	121° 55' 07"	121° 08' 17"
Surface data (Start of Record)	January 24, 1984	May 11, 1983	December 21, 1998	May 17, 1983	May 25, 1983	January 24, 1984	May 19, 1983
Bottom EC Data (Start of Record)	N/A	N/A	N/A	N/A	April 4, 1995	August 4, 1992	December 5, 1990

<sup>1</sup> "All" includes specific conductance (µS), DO (mg/l), pH, water temperature (°C), and air temperature (°C). Other captured parameters vary by site, but include chlorophyll fluorescence, solar radiation intensity (cal/cm<sup>2</sup>/min), wind direction (°), and wind speed (KPH). Real-time data is telemetered at all Stations except Mossdale.

<sup>2</sup> Bottom EC data collected at 1.5 meters from bottom and is sampled each quarter-hour. All other data collected at one meter below surface.

<sup>3</sup> River stage data is in feet at Mean Sea Level (NGVD 1929)

<sup>4</sup> The River Kilometer Index Number is necessary to access the IEP database values.

In the early 1990s, additional instrumentation was installed at the continuous monitoring stations at Antioch, Mallard Island and Martinez to monitor bottom of channel specific conductance and tidal stage. These measurements were needed to determine compliance with the 2 parts per thousand (ppt) salinity standard (also known as X2) mandated by Water Right Decision 1641. The bottom specific conductance is measured at one and one-half meters off the channel bottom.

Selected water quality data from the continuous monitoring stations are available on the Interagency Ecological Program (IEP) HEC-DSS database (<http://www.iep.water.ca.gov/dss/all/>). Complete hourly or quarter hourly data for water temperature, pH, DO, specific conductance, air temperature, bottom specific conductance, and river stage are available unless otherwise noted. Data for all other measured parameters are available by contacting the chief of the Real-Time Monitoring and Support Section, Division of Environmental Services, Office of Water Quality, Environmental Water Quality and Estuarine Studies Branch.

Figures 8-3 through 8-9 show the monthly average values for water temperature, pH, DO, specific conductance, bottom specific conductance, and air temperature for calendar years 1997 through 2000. Gaps in data result from periods when monitoring equipment was inoperable or unavailable. A brief summary for each constituent follows:

**Water Temperature** – Monthly average water temperatures in the upper San Francisco Estuary ranged from 7 °C to 25 °C with lower average water temperatures in the Sacramento River and higher average water temperatures in the San Joaquin River. Monthly average water temperatures in 1997 were higher than those from 1998 through 2000 and ranged from 10.5 °C in the winter or spring on the Sacramento River to a high of 26.5 °C in August 1997 on the San Joaquin River.

**Air Temperature** – Monthly average air temperatures in the upper San Francisco Estuary ranged from 4.7 °C to 24.4 °C with the air temperature extremes noted at the most inland

monitoring stations. The spring and early summer of 1998 were generally cooler than the same time period in 1997, 1999, and 2000.

**Dissolved Oxygen** – DO values in the upper San Francisco Estuary ranged from 7.5 mg/L to 11.0 mg/L with the lower values occurring during summer and fall. All compliance monitoring stations were above the standard of 5.0 mg/L set by the Central Valley Water Resources Control Board in the Basin Plan (CVWRCB 1998) with the exception of the Stockton station where values were highly variable, and ranged from 4.3 mg/L to 10.3 mg/L.

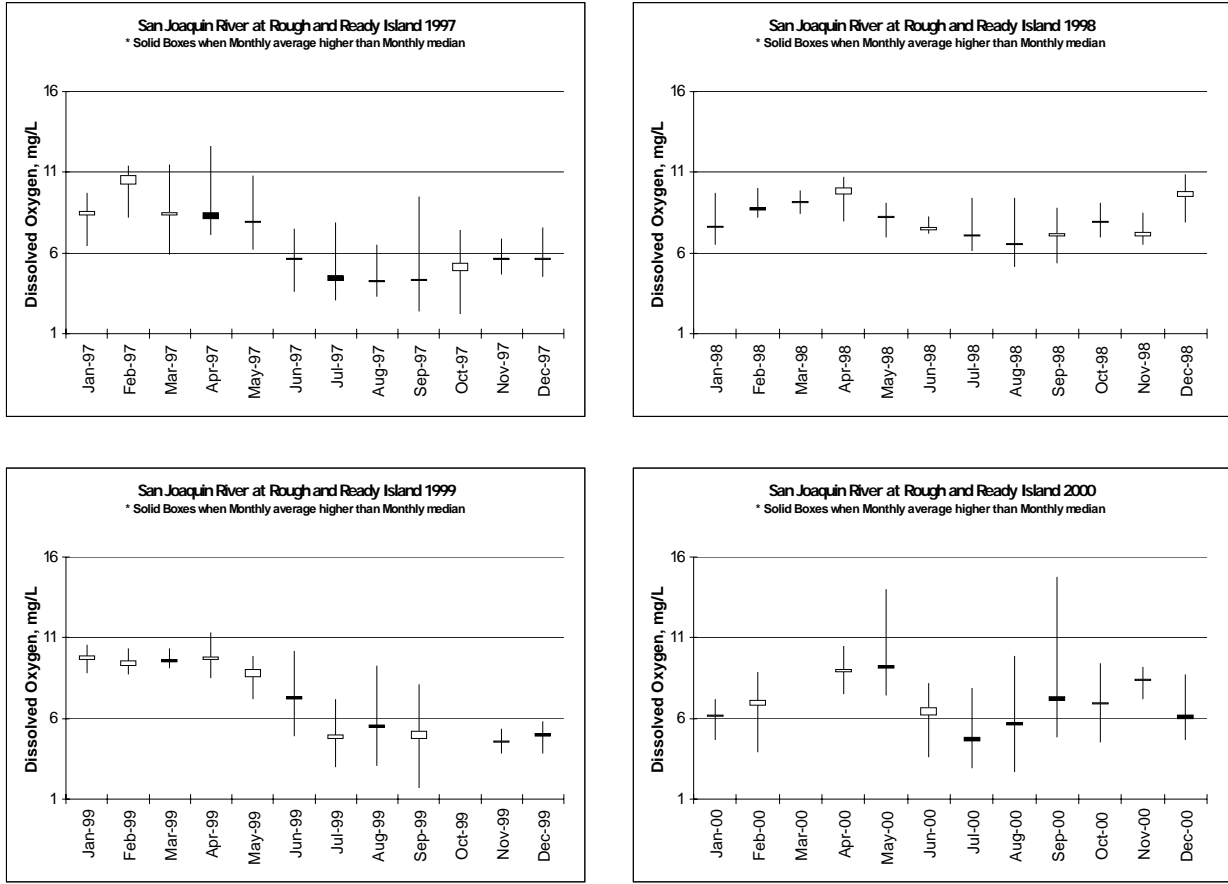
### San Joaquin River Dissolved Oxygen Compliance

Monthly DO values at the Stockton station located on the Stockton Ship Channel remained above the 6.0 mg/L standard for the compliance period of September through November for 1998 and 2000 and were below the 6.0 mg/L standard in 1997 and 1999 (SWRCB Bay-Delta Plan 1995)<sup>12</sup>. Figure 8-2 shows that DO values during the compliance period in 1997 ranged from a low of 2.4 mg/L in to a high of 9.5 mg/L. The values in 1999 ranged from 1.7 mg/L to 9.3 mg/L. The monthly average DO values at Stockton were also below 6.0 mg/L in June, July, and August 2000, but recovered by September 2000 to levels greater than 6.0 mg/L. Finally, monthly average DO values at the Mossdale station for 2000 were exceptionally high for the months of June, July, and August, and ranged from 10 mg/L to 11.2 mg/L with the daily extremes ranging from 7.4 mg/L to 15 mg/L.

**Specific Conductance** – Monthly average specific conductance for the upper San Francisco Estuary ranged from 120  $\mu\text{S}/\text{cm}$  to 27,000  $\mu\text{S}/\text{cm}$  with the lower values in the Sacramento River and the higher values at the more tidally influenced Martinez continuous monitoring station. Bottom specific conductance measured at the Antioch, Mallard Island and Martinez stations exhibited seasonal patterns and ranges similar to the surface specific conductance measurements. Finally, bottom specific conductance values in 1998 were lower than 1997, 1999, and 2000, and ranged from 127  $\mu\text{S}/\text{cm}$  at Mallard Island to 18,900  $\mu\text{S}/\text{cm}$  at Martinez.

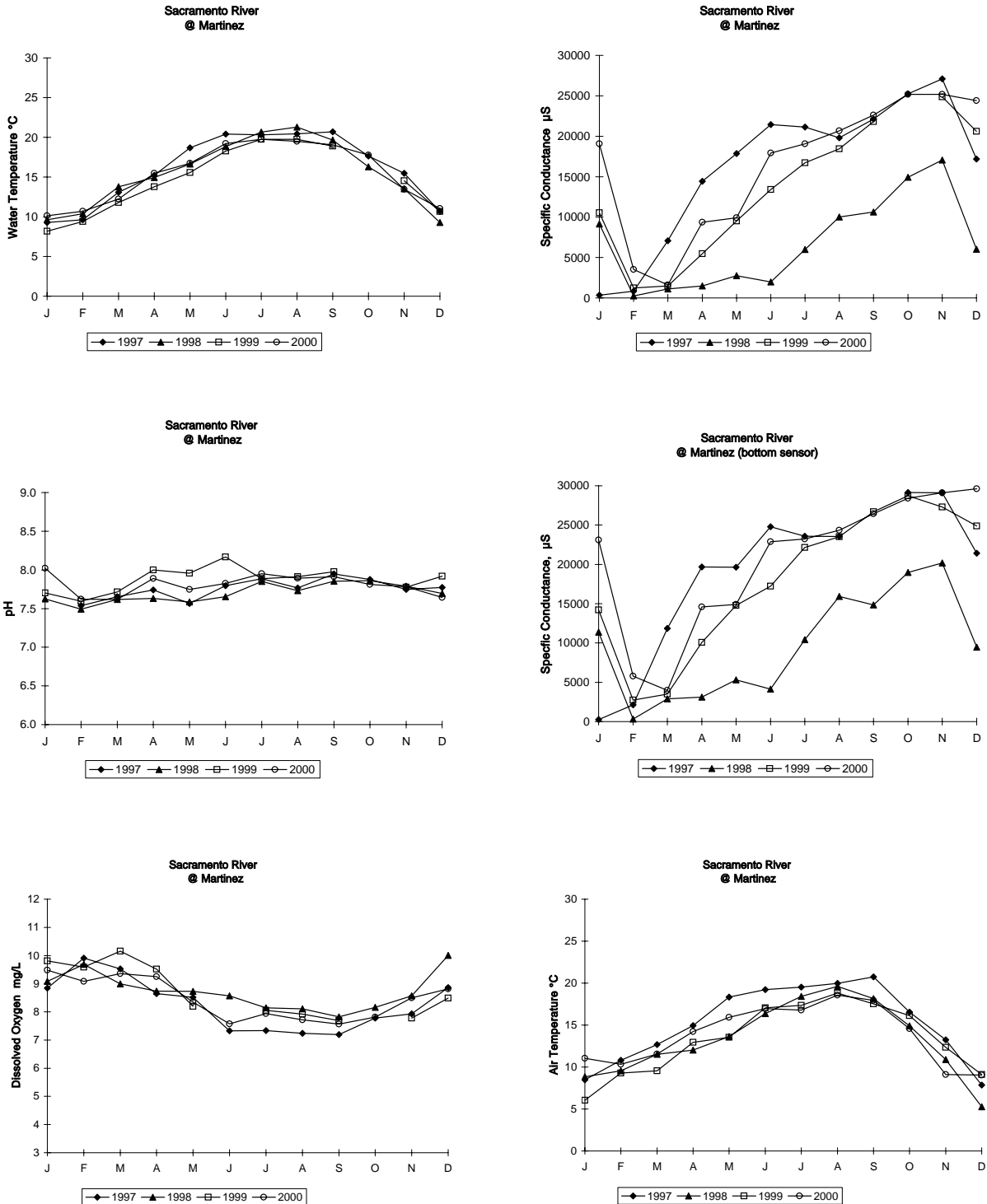
**pH** – Monthly pH levels at all stations were stable and ranged from 7 to 8 pH units, except at Mossdale where pH values in July, August, and September 2000 ranged from 8.0 to 8.5 pH units.

<sup>1</sup> State Water Resources Control Board. 1995. *Water quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Estuary*. Adopted May 22, 1995, pursuant to Water Right Order 95-1. Sacramento, CA. 44pp.

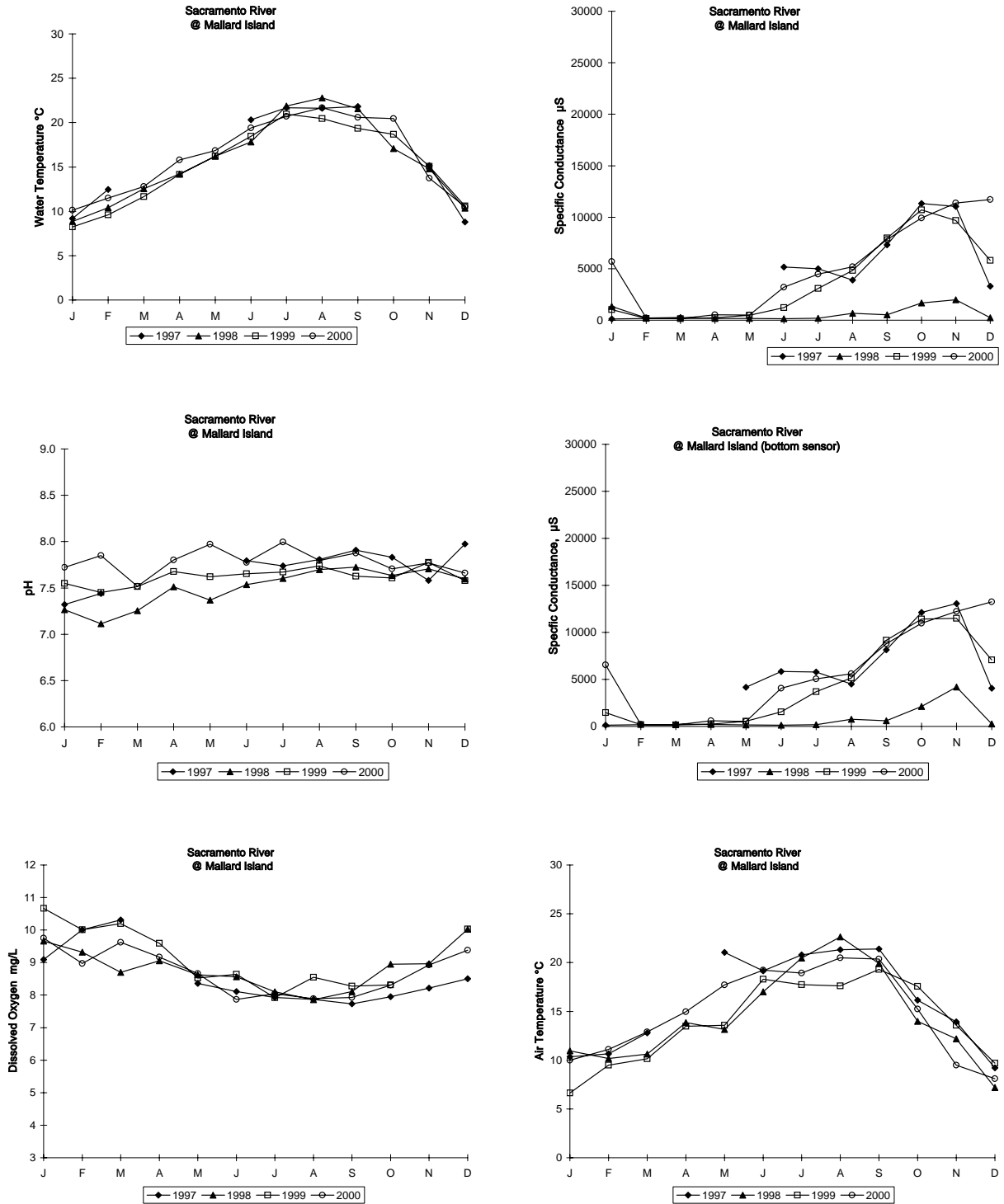


\* No power to station caused missing data for October 1999 and March 2000

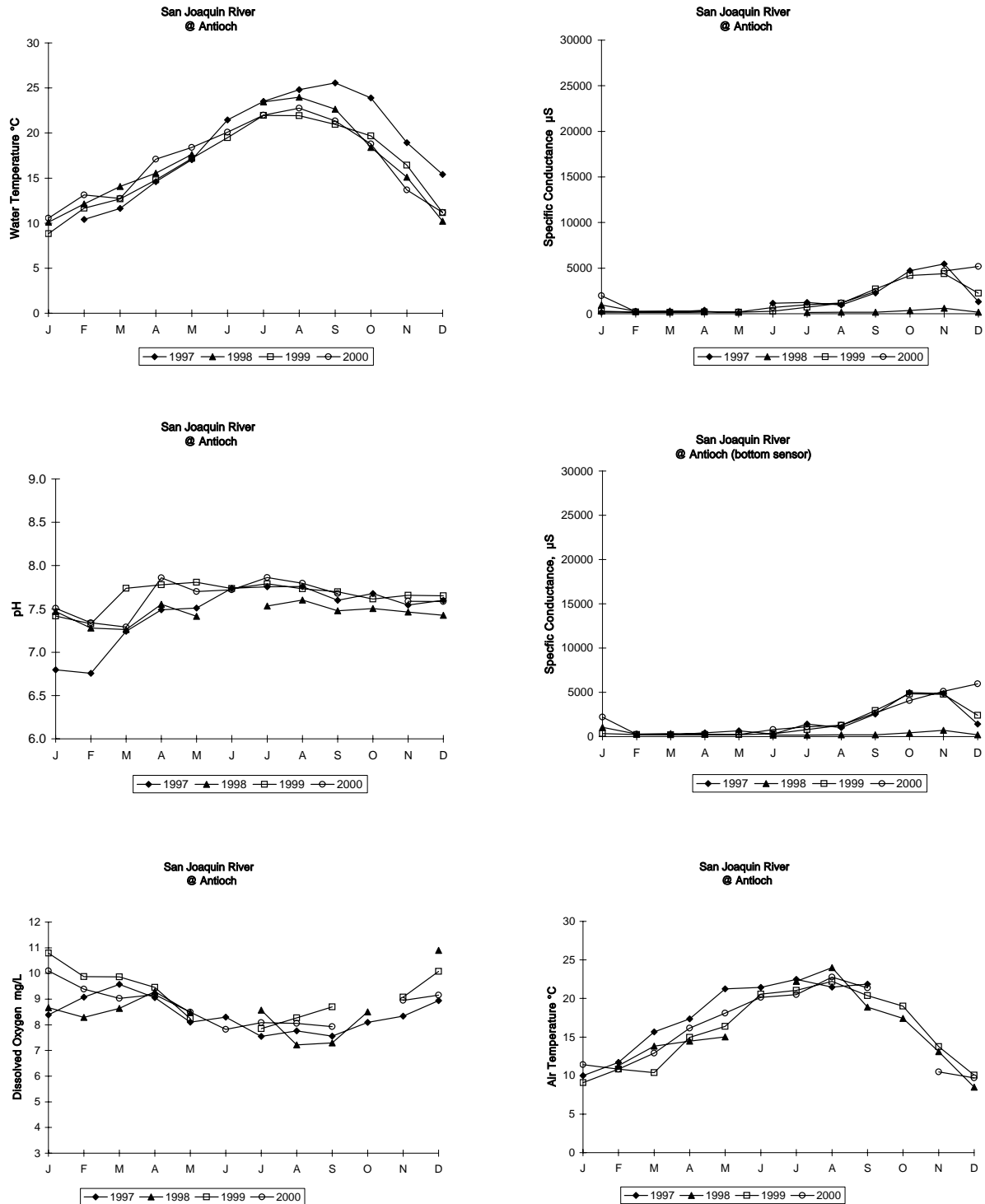
**Figure 8-2 Range of monthly DO values on the San Joaquin River at Rough and Ready Island, 1997-2000**



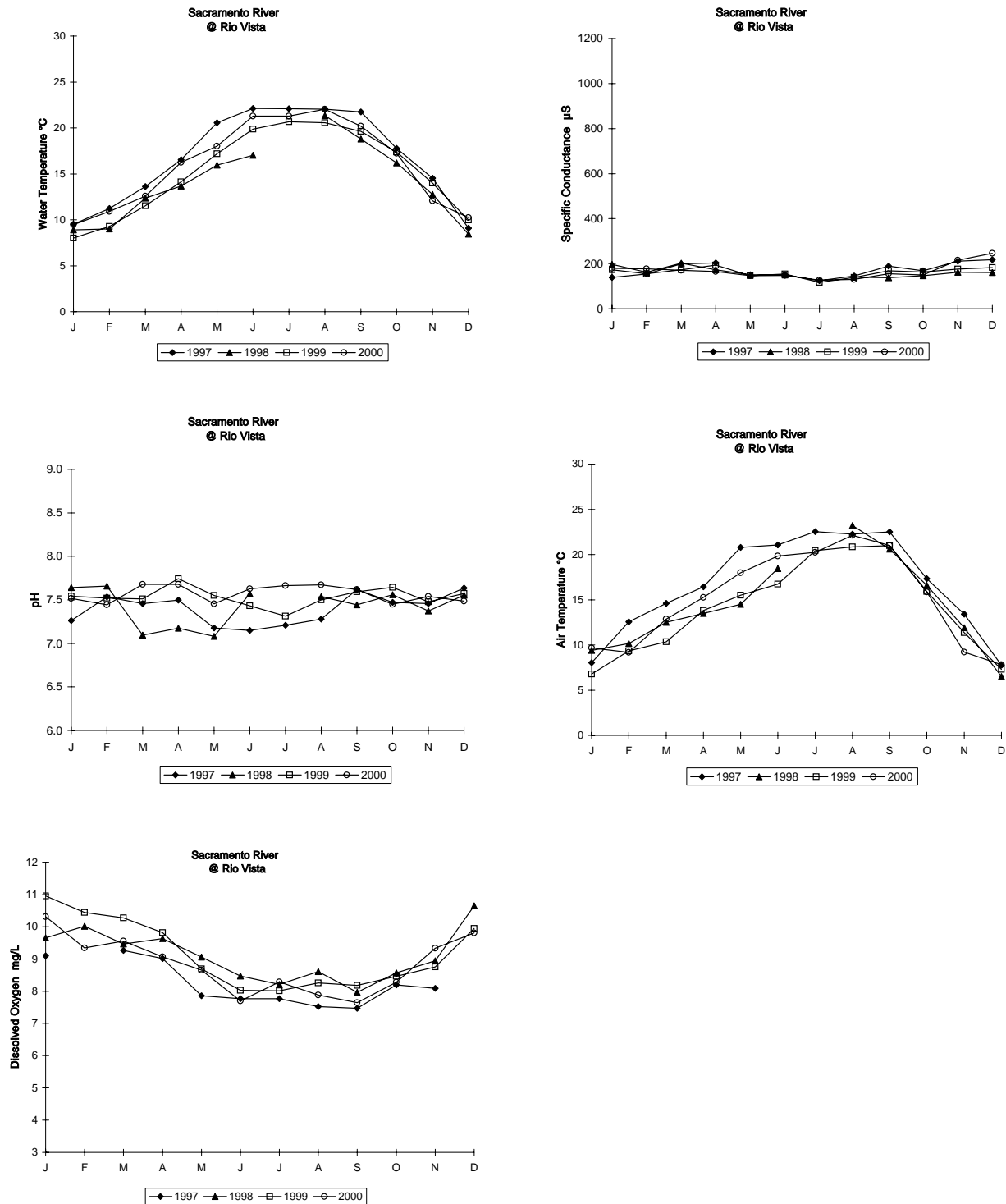
**Figure 8-3 Monthly averages of water quality parameters measured at Martinez for calendar years 1997-2000** (Data for May 1997 are currently stored on discontinued media. Conversion to new media is in process. Data are available upon request.)



**Figure 8-4 Monthly averages of water quality parameters measured at Mallard for calendar years 1997-2000** (Data for May 1997 are currently stored on discontinued media. Conversion to new media is in process. Data are available upon request.)

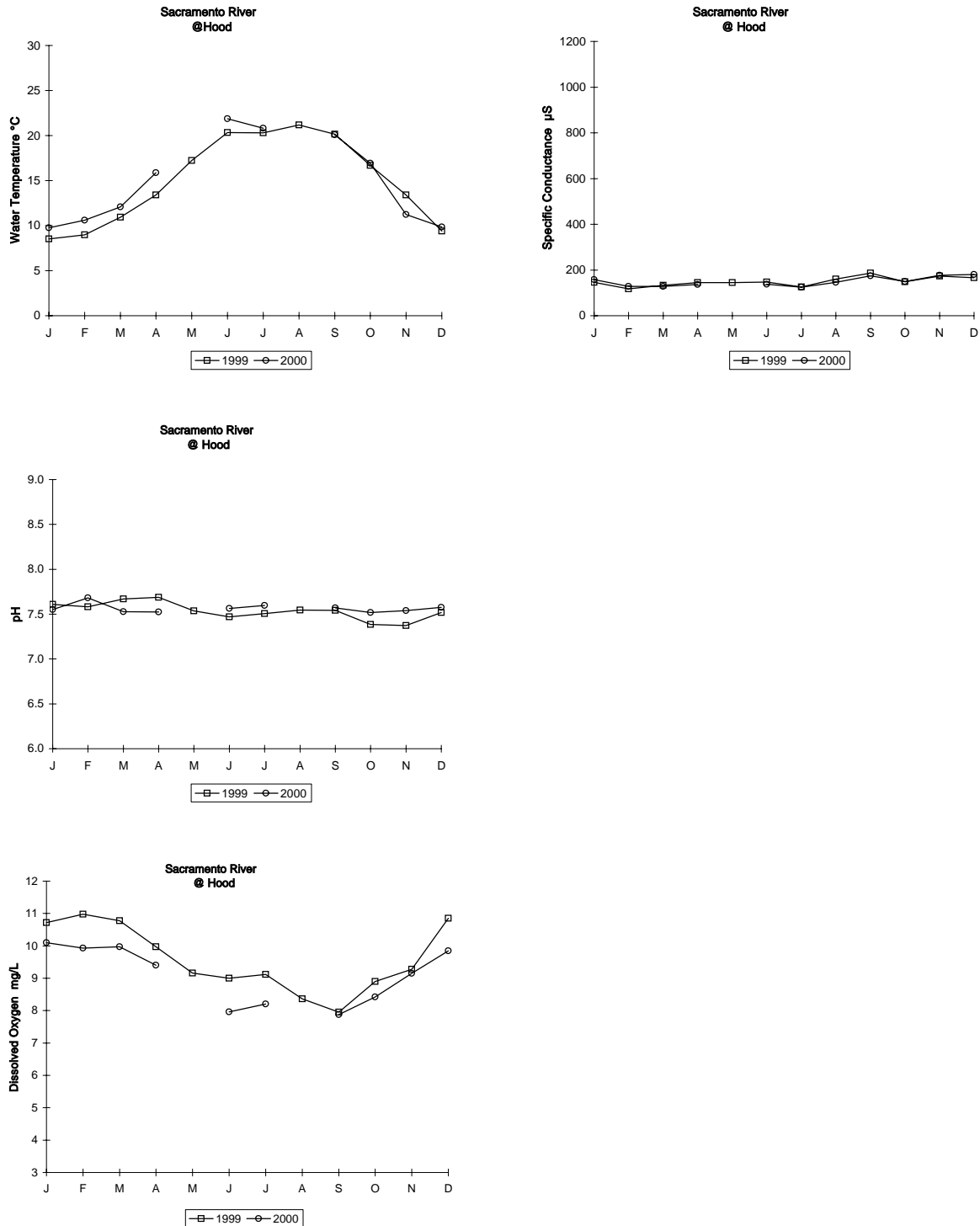


**Figure 8-5 Monthly averages of water quality parameters measured at Antioch for calendar years 1997-2000** (Data for May 1997 are currently stored on discontinued media. Conversion to new media is in process. Data are available upon request.)

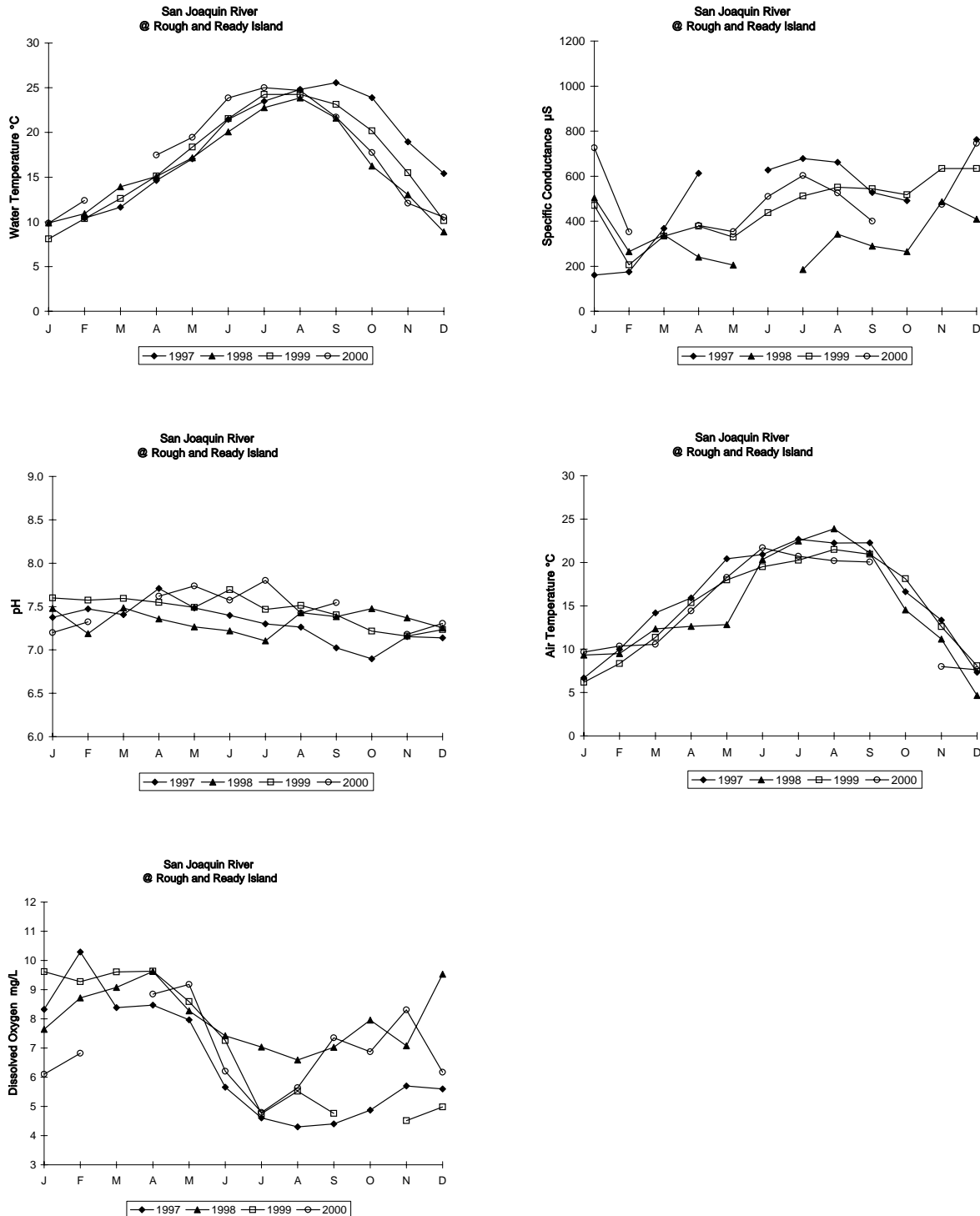


**Figure 8-6 Monthly averages of water quality parameters measured at Rio Vista for calendar years 1997-2000** (Data for May 1997 are currently stored on discontinued media. Conversion to new media is in process. Data are available upon request.)

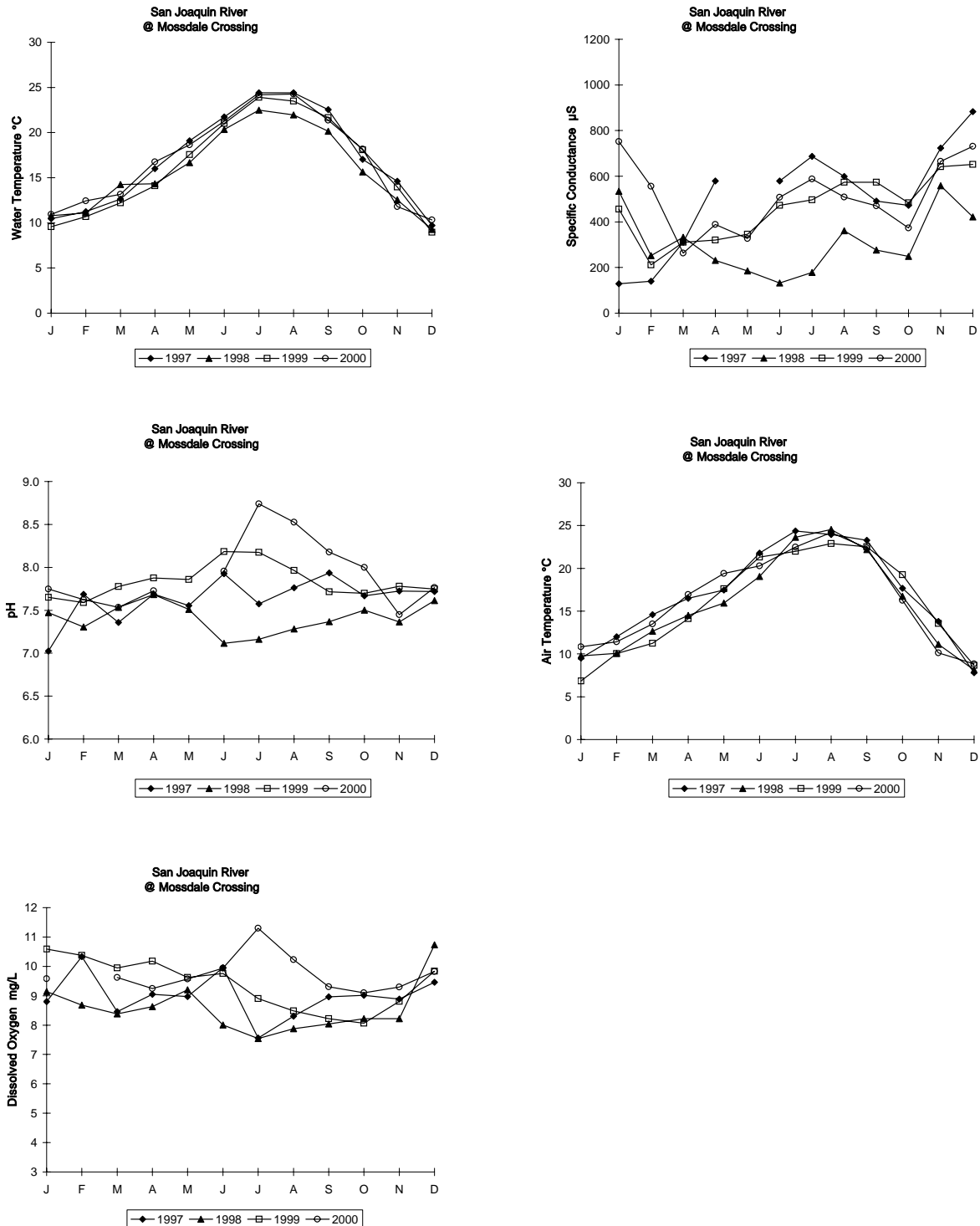




**Figure 8-7 Monthly averages of water quality parameters measured at Hood for calendar years 1999-2000** (The Hood station came online 12/22/98)



**Figure 8-8 Monthly averages of water quality parameters measured at Stockton for calendar years 1997-2000** (Data for May 1997 are currently stored on discontinued media. Conversion to new media is in process. Data are available upon request.)



**Figure 8-9 Monthly averages of water quality parameters measured at Mossdale for calendar years 1997-2000** (Data for May 1997 are currently stored on discontinued media. Conversion to new media is in process. Data are available upon request.)

